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GROWTH OF PLANTED NORWAY (RED) PINE IN NORTHERN MINNESOTA

J. H. Allison (1)

In the spring of 1900 a group of Norway (red) pine (*Pinus resinosa*) plantations were established at the University of Minnesota's North Central School and Experiment Station at Grand Rapids, Minnesota, by Professor Emeritus H. H. Chapman of the Yale School of Forestry (who was at that time Superintendent of the Station). Two plots of this series have been examined and measured at 5-year intervals since 1915, a third plot since 1935. These provide information on growth and yield to be expected from plantations at various spacings (2).

Forest wildlings gathered near Carlton, Minnesota, at an age of from 2 to 4 years, and grown in transplant beds for 2 years to a height of 12 to 18 inches were planted. The plots are nearly level, with soils ranging from fine sands to sandy loams in the first three feet of depth. As measured by growth in height of the dominant trees these plots are located on a good site for Norway pine.

Approximately 1200 trees per acre were planted on each of the 3 plots reported. A fire which burned through the young stand 5 years after its establishment, together with some mortality from natural causes, varied the initial spacing. This variation made possible, during subsequent periods, comparisons of growth and yield which appear to be related to these spacing differences. During the 35-year period encompassed (1915-1950), the number of live trees per acre on plot A was reduced negligibly from 548 to 513, while on plot B the reduction from 436 to 315 was relatively constant through time. During the 15-year period for which data are available on plot C, the corresponding reduction was also negligible, from 220 to 217. The development and present status of these plantations are shown in the figures below.

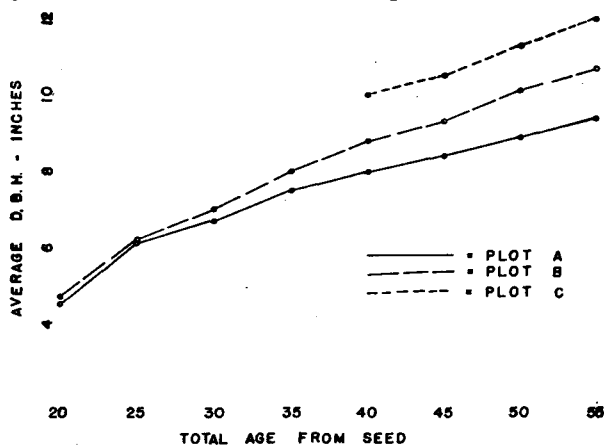


Fig. 1. Average dbh of Norway pine grown at various spacings

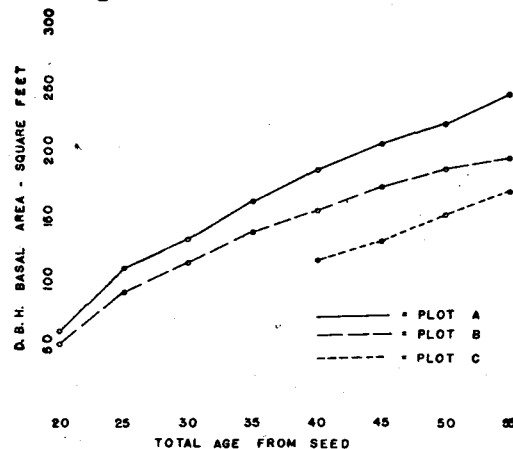


Fig. 2. Average basal area per acre of Norway pine grown at various spacings

- (1) Professor Emeritus, University of Minnesota School of Forestry.
- (2) A joint contribution with the North Central School and Experiment Station.

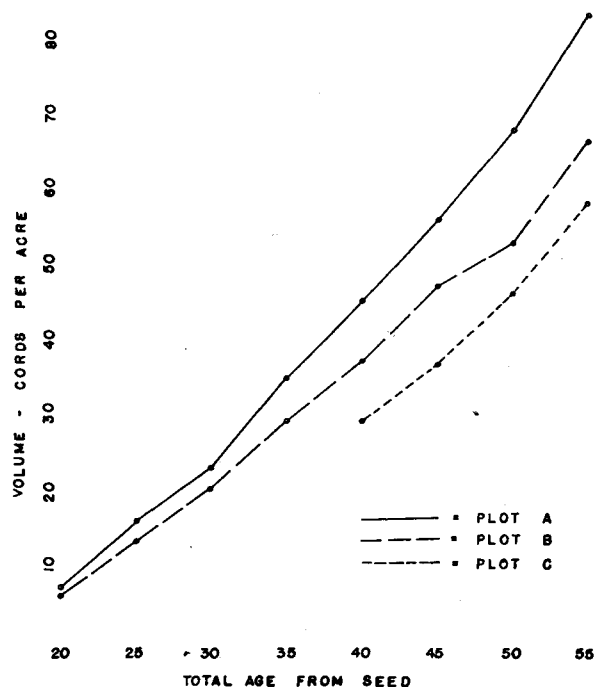


Fig. 3. Volume in cords per acre of Norway pine grown at various spacings

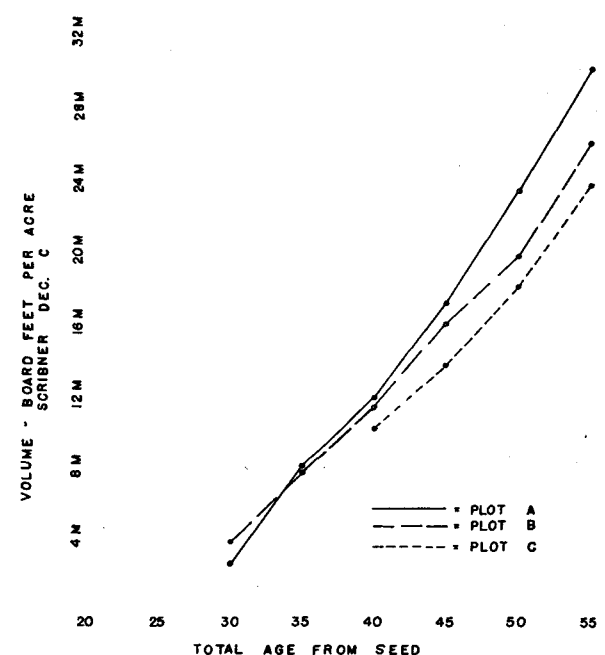


Fig. 4. Volume in board feet (Scribner Decimal C) of Norway pine grown at various spacings

The table below provides a comparison of the yield per acre of these plots at age fifty with that of good site Norway pine in fully-stocked, unmanaged stands (3).

Growth and Yield Per Acre of Planted Norway Pine at Age Fifty

	Average Diameter (Inches)	No. Trees	Basal Area (Sq. Ft.)	Mean Annual Growth (Basal Area)	Cubic Feet	Mean Annual Growth (Cubic Feet)	Cords	Mean Annual Growth (Cords)	Board Feet Scribner	Mean Annual Growth (Board Feet)	Additional Cords (Small Trees and Tops)
Plot A	8.9	517	224	4.5	5,895	118	68	1.4	23,400	468	(Not available)
Plot B	10.1	317	178	3.6	4,591	92	53	1.1	19,800	396	(Not available)
Plot C	11.3	220	153	3.1	4,012	80	46	0.9	18,200	364	(Not available)
Yield Table Data (2)	9.4	336	162	3.2	3,700	74	50	1.0	12,000	240	12

At 50 years of age these plots indicate:

- (1) That density of stand (about 225 trees per acre, quite evenly spaced, as against 500 to 600 trees per acre at ages of 20 to 40 years) has had very little influence on the height and general form of dominants and co-dominants in this planted Norway pine stand;
- (2) That pruning in the most open (225 trees per acre) of these plots has brought as good quality growth as has combined thinning and pruning in the much denser stands;
- (3) That the denser stocking (500 or more trees per acre up to 50 years of age) has resulted in appreciably greater volume production, both cubic foot and board foot, than has occurred in stands of less dense stocking;
- (4) That less densely stocked stands have larger trees than more densely stocked. Since this is a significant factor in dollar value per thousand board feet, it tends to offset, at age 50, the reduced volume production.

(3) Eyre, F. H. and Paul Zehngraff. 1948. Red pine management in Minnesota. U. S. - D. A. Circ. No. 778. Published as Scientific Journal Series Paper No. 3236 of the Minnesota Agricultural Experiment Station.